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PATENT ABSTRACTS OF JAPAN

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(54) ELECTRIC CONDUCTIVE GLASS AND ITS PRODUCTION

(57)Abstract:

PURPOSE: To provide an alkali diffusion preventing film for electric conductive glass having heat resistance, stable even to various environmental conditions and not causing deterioration.

CONSTITUTION: An alkali barrier film inhibiting alkali diffusion from alkali- contg. glass and an electric conductive film are successively laminated on the surface of the alkali-contg. glass to obtain the objective electric conductive glass. The alkali barrier film is a film based on an oxide having 5-95% atomic ratio of Sn to (Sn+Si).

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CLAIMS

[Claim]

[Claim 1] It is the electroconductive glass which is an electroconductive glass which carried out the laminating of the alkali barrier layer which suppresses the alkali diffusion from this glass on the front face of alkali inclusion glass, and the conducting film one by one, and is characterized by the above-mentioned alkali barrier layer being an oxide layer which makes tin and silicon a principal component.

[Claim 2] The electroconductive glass of the claim 1 publication to which an alkali barrier layer is characterized by rate $\text{Sn}/(\text{Sn}+\text{Si})$ of tin and silicon being 5% to 95% in an atomic ratio.

[Claim 3] The manufacture technique of the electroconductive glass characterized by forming in the front face of alkali inclusion glass the oxide layer which makes tin and silicon a principal component as an alkali barrier layer, and subsequently forming a conducting film in it.

[Claim 4] The manufacture technique of the electroconductive glass the claim 3 publication characterized by forming a conducting film by the DC-sputtering method continuously with an alkali barrier layer.

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DETAILED DESCRIPTION

[Detailed description]

[0001]

[Field of the Invention] this invention relates to the electroconductive glass with an alkali barrier layer which protects carrying out an alkali ionic diffusion from the glass substratum of alkali inclusion glass.

[0002]

[Prior art] Since it is chemically stable and it excels in a surface hardness, and the elevated temperature to about 500-700 degrees C is borne and an electric insulation and optical property are further excellent, of course, the glass plate as a transparent material is used for an optic, electrical-part electronic parts, etc. as the object for construction, the object for vehicles, and a glass-pane material for aircrafts.

[0003] Especially, recently, the electroconductive-glass plate in which the conductive coat was formed to the glass-plate side is used for display devices, amorphous-solar-cell substrates, etc., such as a liquid crystal device, an electrochromic element, and an electroluminescence element. Although there is an inclination that it is most used widely and a soda-lime silica-glass plate cheap also in price is used as a glass substrate of these electroconductive-glasses plate, since this soda-lime silica-glass plate contains alkali components, such as about [10-20wt%] sodium and a potassium, in composition, it produces the fault of causing the performance degradation of the coated conducting film by diffusion of the alkali ion to the front face from a glass substratum by prolonged use.

[0004] For example, and transparency falls, the resistance of a conducting film increases, or chemical physical endurance falls. [that nebula arises in the conducting film of an electroconductive-glass plate] That is, with a liquid-crystal-display element, an oxidation-reduction reaction happens on a display electrode front face by the alkali diffused from glass, the indium oxide layer (ITO layer) which is a transparent-electrode material, or a tin-oxide layer (Nesa membrane) is deteriorated, further, the liquid crystal itself causes electrolysis and it deteriorates. An electrode is worn out by the ground with the same said of an electrochromic element, it becomes the cause of a fall of the endurance of the tungstic oxide which is an electrochromic materials, or a molybdenum oxide, and an element is degraded.

[0005] Moreover, the alkali which came out from the glass front face by diffusion also in the case of the electroluminescence element penetrates a conducting film, enters into a fluorescent substance material, and is changed also to luminous efficiency or the luminescent color. Furthermore, in the case of an amorphous solar cell, the resistance of a conducting film will increase, a photoelectric conversion efficiency will fall to it remarkably, and the alkali which occasionally penetrated the electrode and came out is supposed that there is also a possibility of it being spread in an amorphous silicon and reducing a conversion efficiency.

[0006] Or again, alkali inclusion glass like a soda-lime silica glass has the inclination alkali ion becomes easy to move at the time of high temperature processing, and also produces the fault that the performance of a conducting film or various coat layers falls, by diffusion of the alkali ion at the time of high temperature processing at the time of a manufacture of an electroconductive glass or various coat glass.

[0007] As solution of such a fault, the technique of forming in a usual soda-lime silica-glass front face the thin film which prevents a certain alkali diffusion is typical, and, generally the silica layer is used. It is based on the transparency of glass not being spoiled by glass to the light of near and a domain usually larger than sheet glass, since it is transparent, although the refractive index of that the same layer as having formed on glass substantially when the ground for using a silicon oxide layer (for example, SiO₂ layer) for alkali diffusion prevention had an amorphous layer and it formed another thin film on this, for example, a conducting film etc., can be formed, and a silicon oxide layer is lower than glass a little.

[0008]

[Object of the Invention] As opposed to the conducting film formed on an alkali barrier layer being ****ed in the

uniform layer over a large area by the DC-sputtering method which can be formed at high speed however, a silicon oxide layer If it is going to **** by the DC-sputtering method using Si target Since the front face of Si target was able to oxidize, conductivity was able to fall during a spatter and a spatter was not able to be made to maintain stably, by the DC-sputtering method, it cannot **** but, for this reason, ****ed by the RF sputtering method, CVD, etc. using the oxide target.

[0009] For this reason, since a tuning of RF sputtering, a spatter ambient-atmosphere control, etc. of a silicon-dioxide layer were needed apart from the formation technique of a conducting film or it had to **** by CVD with another equipment, a silicon-dioxide layer could not be continuously formed with a conducting film with in-line, but it had the technical problem that it was inferior to a productivity.

[0010]

[The means for solving a technical problem] this invention finds out the new alkali barrier layer which can **** by the DC-sputtering method based on an above-mentioned technical problem, and is made. The alkali barrier layer which suppresses the alkali diffusion from this glass on the front face of alkali inclusion glass, On and the front face of the electroconductive glass characterized by being the electroconductive glass which carried out the laminating of the conducting film one by one, and the above-mentioned alkali barrier layer being an oxide layer which makes tin and silicon a principal component, and alkali inclusion glass The manufacture technique of the electroconductive glass characterized by forming the oxide layer which makes tin and silicon a principal component as an alkali barrier layer, and subsequently forming a conducting film is offered.

[0011] The alkali barrier layer of this invention is an oxide layer which makes tin and silicon a principal component. The occurrence frequency of an arcing is low on the alkali barrier layer of this invention, and it is stabilized, can do DC sputtering, and fits **** to a large area substrate. However, if the content of Si is made [many] like [below-mentioned], the occurrence frequency of an arcing will increase. Moreover, he becomes quick as **** Leto's content of tin increases. For example, **** Leto of the oxide layer of tin:silicon =1:1 is quick about 2.5 times compared with the silicon-dioxide layer of RF spatter. Therefore, alkali barrier ***** is made more for a short time.

[0012] The adherability with the soda-lime glass of the alkali barrier layer of this invention is equivalent to the adherability of an ordinary silicon dioxide and soda-lime glass. Since tin contains this in case soda-lime glass is manufactured by the float glass process, it is because it is similar also in after the alkali barrier layer and soda-lime glass of this invention forming.

[0013] It is desirable to contain Si at a rate more than Si pentatomic to metal total quantity 95 atom of tin as composition of the alkali barrier layer of this invention. It is because the parvus and a layer serve as [Si content] a crystalline substance from this rate and alkali barrier ability falls notably. Moreover, it is desirable to contain Si at a rate of 95 or less atoms of Si to the total quantity pentatomic of the metal of tin. If Si content is larger than this rate, by the scaling of a target, an arcing will occur frequently and it will become unable to **** by the DC-sputtering method stably.

[0014] The refractive index of the alkali barrier layer of this invention can be freely adjusted with the composition. The refractive-index change by composition of the alkali barrier layer of this invention is shown in Table 1.

[0015]

[Table 1]

膜組成 ZrとSiの酸化物中の Sn : Si		煮沸テ スト ^{*1}	屈折率 n	結晶性	アルカリ バリアー性 ^{*2}
96	4	○	2.00	結晶質	×
91	9	○	1.98	アモルファス	○
80	20	○	1.91	アモルファス	○
70	30	○	1.82	アモルファス	○
50	50	○	1.70	アモルファス	○
33	67	○	1.65	アモルファス	○
20	80	○	1.57	アモルファス	○
10	90	○	1.50	アモルファス	○
5	95	○	1.47	アモルファス	○

膜厚は全て1000Åである。

*1: 1気圧下、100℃の水に2時間浸漬した後T、(可視光線透過率)、R、(可視光線反射率)の浸漬前に対する変化率が1%以内のものを○とした。

*2: 純水と接触させて90℃に24時間保存した後の純水中へのNa⁺の溶出量が1.0μg/cm²以上のものを×、1.0μg/cm²未満のものを○とした。

[0016] therefore, in the case of the electroconductive glass as transparent-electrode plates with which transparent electrodes, such as ITO layer (indium oxide layer containing tin), were formed as a conducting film, such as a display device If it is made to become the same refractive index as such a transparent electrode, composition of the alkali barrier layer of this invention Since the difference of the refractive index with the fraction in which only the alkali barrier layer was formed, without forming the fraction and transparent electrode by which the transparent-electrode pattern was formed on the alkali barrier layer does not arise, a transparent-electrode pattern is not conspicuous and the "bone vanity" phenomenon of the so-called transparent-electrode pattern can be prevented. What is necessary is to double with the refractive index 1.9 [about] of ITO layer, and just to be about [Sn:Si=80:20] from Table 1 in the electroconductive glass of the configuration of the alkali barrier layer / ITO layer which consists of an oxide containing a glass plate / Sn and Si.

[0017] Or in a manufacture of the element for a display etc., when the direction a transparent-electrode pattern appears is liked in respect of alignment, it is suitable, and considering as the refractive index different from ITO layer can make [many] the rate of Si, and it can also consider as a low refractive index. Thus, composition of the alkali barrier layer of this invention can be suitably chosen according to the refractive index of the conducting film formed on it.

[0018] As for the thickness of the alkali barrier layer of this invention, it is desirable to carry out to more than 50** so that sufficient alkali barrier ability may be demonstrated. Especially, the domain of 100 - 5000** is the most practical.

[0019] moreover, Na and K which are most used widely as glass applicable to the electroconductive glass of this invention -- 10 - 20wt% -- the included soda-lime silica glass -- of course -- in addition, various alkali inclusion glass is mentioned

[0020] As a conducting film formed on an above-mentioned alkali barrier layer in the electroconductive glass of this invention, it is SnO₂ by which ITO layer, F, Sb, etc. were doped. It is not limited especially that what is necessary is just the conducting films which may deteriorate by alkali ion, such as conductive metal membranes, such as transparent conductivity oxide layers, such as ZnO layer with which a layer, aluminum, etc. were doped, and Ag, Au.

[0021]

[Example]

With the detergent, the common-glass plate (soda-lime silica-glass plate) which contains example 110cmx10cmx3mm alkali component R₂O (R: Na, K) 15% was fully washed, and carried out rinsing xeransis. target (Sn:Si=50:50) which

consists of Sn and Si after arranging this glass plate in the vacuum tub of a sputtering system and exhausting the inside of this tub to 1×10^{-5} Torr the inside (argon:oxygen = 1:1) of the argon of 2×10^{-3} Torr, and the mixed gas of oxygen -- power density 5W/cm² DC sputtering -- carrying out -- Sn_{0.5} Si_{0.5} O₂ a layer -- about -- 1000** formation of was done

[0022] It is SiH₄ to the same glass plate as example of comparison 1 example 1. O₂ Gas is used and it is SiO₂ by CVD. 1000** formation of a layer was done.

[0023] Na⁺ eluted in the pure water after having contacted one example and one example of a comparison to the pure water, respectively and holding them at 90 degrees C for 24 hours the place example 1 article which measured the amount and investigated alkali barrier nature -- one 0.61microg [/cm] 2 and the example of a comparison -- 0.61microg/cm² it was . moreover, Na⁺ which washed one example and one example of a comparison by NaOH 5%, respectively, was next contacted to the pure water at the room temperature for 24 hours, and was eluted in the pure water the place which measured the amount (amount of Na⁺ which adsorbed during the above-mentioned washing), and investigated the alkali adsorptivity -- one example -- one 0.13microg [/cm] 2 and the example of a comparison -- 0.14microg/cm² it was . From this, one example found that there was a property almost equivalent to the example of a comparison.

[0024] It is Sn_{0.5} Si_{0.5} O₂ like example 2 example 1. Abbreviation 200** formation of a layer was done.

[0025] It is SnSi₂ as example 3 target. Others are Zr_{0.33}Si_{0.66}O₂ like an example 1 using a target (Sn:Si=1:2). Abbreviation 200** formation of a layer was done.

[0026] It is Sn_{0.33}Si_{0.66}O₂ like example 4 example 3. Abbreviation 500** formation of a layer was done.

[0027] After having made the pure water contact, respectively and saving at 85 degrees C per 2-4 examples for 24 hours, when alkali barrier nature and the alkali adsorptivity were measured, it became as it is shown in Table 2.

[0028]

[Table 2]

試 料	アルカリ バリアー膜	膜 厚 A	アルカリバリア ー性Na ⁺ 溶出量 ($\mu\text{g}/\text{cm}^2$)	アルカリ吸着 性Na ⁺ 吸着量 ($\mu\text{g}/\text{cm}^2$)
実施例 2 品	Sn _{0.5} Si _{0.5} O ₂	200	0.63	0.074
実施例 3 品	Sn _{0.33} Si _{0.66} O ₂	200	0.43	0.031
実施例 4 品	Sn _{0.33} Si _{0.66} O ₂	500	0.12	0.047

[0029] Although it continued by the DC-sputtering method by the DC-sputtering method per 1-4 examples on [after forming each alkali barrier layer] such an alkali barrier layer, and ITO layer was formed and being saved at 90 degrees C after that for 24 hours, there was no appearance change of ITO layer.

[0030]

[Operation] In this invention, although Sn exists as an Sn-Si alloy in a target, the oxides produced on a target during a reactant spatter are the oxide of tin, and an oxide of silicon. Among these, since the former has an electric conduction-property, it is considered that occurrence of an arcing is suppressed.

[0031]

[Effect of the invention] Since the alkali barrier layer of the electroconductive glass of this invention can be ****ed by the DC-sputtering method, over a large area, it can form a uniform layer stably at high speed, and can offer it. Since this can **** an alkali barrier layer and a conducting film continuously by the in-line formula when forming the conducting film formed on an alkali barrier layer by the DC-sputtering method, it serves as a big advantage especially on a productivity.

[0032] Especially as an alkali diffusion prevention layer of an electroconductive glass used for display devices, amorphous-solar-cell substrates, etc., such as a liquid crystal device, an electrochromic element, and an electroluminescence element, the electroconductive glass with an alkali barrier layer of this invention is the optimum, it also has thermal resistance, as shown in Table 1, and to manufacture processes, such as such a display device and a solar battery, or subsequent various environmental conditions, is stable and does not deteriorate. Of course, it is applicable to the glass plate for an automobile, the aircraft, other rail car and various objects for traffic vehicles, the object for construction, the various objects for equipment, the object for optics, the object for electrical parts, and

electronic parts other than these useful to the substratum coat at the time of forming a conductive coat, a heat ray acid-resisting coat, a reflective coat, a tinting coat, in addition the coat with various functions.

[0033] Moreover, since the alkali barrier layer of this invention can be made into a desired refractive index by changing the metal of Sn, and the rate of Si, it can be broadly used for the various above-mentioned intended use.

[Translation done.]

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(54) 【発明の名称】 電導性ガラス及びその製造方法

(57) 【要約】

【構成】 アルカリ含有ガラスの表面に、該ガラスからのアルカリ拡散を抑制するアルカリバリアー膜、及び電導膜を順次積層した電導性ガラスであって、上記アルカリバリアー膜は錫と珪素の割合 $Sn / (Sn + Si)$ が原子比で5%から95%である酸化物を主成分とする膜である。

【効果】 耐熱性を有し、種々の環境条件に対しても安定で劣化することがない電導性ガラスのアルカリ拡散防止膜を提供できる。

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【課題を解決するための手段】本発明は上述の課題に基づき直流スパッタリング法で成膜できる新規なアルカリバリアー膜を見出してなされたものであって、アルカリ含有ガラスの表面に、該ガラスからのアルカリ拡散を抑制するアルカリバリアー膜、及び電導膜を順次積層した導電性ガラスであって、上記アルカリバリアー膜は銅と酸素と下成分とする酸化物組成からなることを特徴とする。

導性ガラス及びアルカリ含有ガラスの表面に、錫と珪素を主成分とする酸化物膜をアルカリバリアー膜として形成し、次いで電導膜を形成することを特徴とする電導性ガラスの製造方法を提供するものである。

【0011】本発明のアルカリバリアー膜は、錫と珪素を主成分とする酸化物膜である。本発明のアルカリバリアー膜はアーキングの発生頻度が少なく、安定して直流スパッタリングができ、大面積基板への成膜に適している。ただし、後述のようにSiの含有量を多くしていくと、アーキングの発生頻度が増加する。また、成膜レートは錫の含有量が増えるにつれ、速くなる。例えば、錫：珪素＝1：1の酸化物膜の成膜レートはR.F.スパッタの二酸化珪素膜に比べると約2.5倍速い。従って、より短時間でアルカリバリアー膜成膜ができる。

【0012】本発明のアルカリバリアー膜のソーダライムガラスとの付着性は、普通の二酸化珪素とソーダライムガラスとの付着性と同等である。これはソーダライムガラスがフロート法で製造される際に錫が含有されるた*

*め、本発明のアルカリバリアー膜と、ソーダライムガラスが組成の上でも類似しているためである。

【0013】本発明のアルカリバリアー膜の組成としては、錫の金属合計量95原子に対してSi5原子以上の割合でSiを含有しているのが好ましい。Si含有量がこの割合より小さいと膜が結晶質となりアルカリバリアー能が顕著に低下するからである。また、錫の金属の合計量5原子に対してSi95原子以下の割合でSiを含有しているのが好ましい。Si含有量がこの割合より大きいと、クーゲットの表面酸化により、アーキングが頻繁に発生し、安定的に直流スパッタリング法で成膜できなくなる。

【0014】本発明のアルカリバリアー膜の屈折率はその組成により自由に調節することができる。本発明のアルカリバリアー膜の組成による屈折率変化を表1に示す。

【0015】

【表1】

膜組成 ZrとSiの酸化物中の Sn : Si		煮沸テスト ¹⁾	屈折率 n	結晶性	アルカリ バリアー性 ²⁾
96	4	○	2.00	結晶質	×
91	9	○	1.98	アモルファス	○
80	20	○	1.91	アモルファス	○
70	30	○	1.82	アモルファス	○
50	50	○	1.70	アモルファス	○
33	67	○	1.65	アモルファス	○
20	80	○	1.57	アモルファス	○
10	90	○	1.50	アモルファス	○
5	95	○	1.47	アモルファス	○

膜厚は全て1000Åである。

*1: 1気圧下、100℃の水に2時間浸漬した後T、(可視光線透過率)、R、(可視光線反射率)の経漬前に対する変化率が1%以内のものを○とした。

*2: 純水と接触させて90℃に24時間保存した後の純水中へのNa⁺の溶出量が1.0μg/cm²以上のものを×、1.0μg/cm²未満のものを○とした。

【0016】従って、電導膜としてITO膜(錫を含有する酸化インジウム膜)等の透明電極が形成された表示素子等の透明電極板としての電導性ガラスの場合には、本発明のアルカリバリアー膜の組成をかかると透明電極と同様の屈折率になるようにすれば、アルカリバリアー膜上に透明電極パターンが形成された部分と透明電極が形成されずにアルカリバリアー膜のみが形成された部分との屈折率の差が生じないため、透明電極パターンが目立たず、いわゆる透明電極パターンの“目見え”現象を防

止できる。ガラス板/SnとSiを含む酸化物からなるアルカリバリアー膜/ITO膜の構成の電導性ガラスにおいては、ITO膜の屈折率約1.9に合わせて表1よりSn:Si=80:20程度とすればよい。

【0017】あるいはディスプレイ用素子等の製造において、位置合せの点で、透明電極パターンが見える方が好まれるような場合にはITO膜と異なる屈折率とするのが適当であり、Siの割合を多くして低屈折率とすることもできる。このように、本発明のアルカリバリアー

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膜の組成は、その上に形成される電導膜の屈折率に応じて適宜選択することができる。

【0018】本発明のアルカリバリアー膜の膜厚は、十分なアルカリバリアー能が発揮されるように、50Å以上とするのが好ましい。中でも、100～5000Åの範囲が最も実用的である。

【0019】また、本発明の電導性ガラスに適用できるガラスとしては、最も汎用されているNaやKを10～20wt%含むソーダライムシリカガラスは勿論、その他各種アルカリ含有ガラスが挙げられる。

【0020】本発明の電導性ガラスにおいて、上述のアルカリバリアー膜上に形成される電導膜としては、1Tの膜、FやSh等がドーブされたSnO₂膜、Al等がドーブされたZnO膜等の透明電導性酸化物膜や、Ag、Au等の電導性金属膜等、アルカリイオンによって劣化する可能性のある電導膜であればよく、特に限定されない。

【0021】

【実施例】

実施例1

10cm×10cm×3mmのアルカリ成分R₂O (R:Na,K)を15%含む普通ガラス板(ソーダライムシリカガラス板)を洗剤で十分に洗浄し、水洗乾燥した。このガラス板をスパッタリング装置の真空槽内に配位して同槽内を1×10⁻⁴Torrまで排気した後、SnとSiからなるターゲット(Sn:Si=50:50)を2×10⁻³Torrのアルゴンと酸素の混合ガス中(アルゴン:酸素=1:1)でパワー密度5W/cm²で直流スパッタリングを行い、Sn_{0.5}Si_{0.5}O₂膜を約1000Å形成した。

【0022】比較例1

試料	アルカリバリアー膜	膜厚 Å	アルカリバリアー性Na ⁺ 溶出量 (μg/cm ²)	アルカリ吸着性Na ⁺ 吸着量 (μg/cm ²)
実施例2品	Sn _{0.5} Si _{0.5} O ₂	200	0.63	0.074
実施例3品	Sn _{0.33} Si _{0.67} O ₂	200	0.43	0.031
実施例4品	Sn _{0.33} Si _{0.67} O ₂	500	0.12	0.047

【0029】実施例1～4品につき、直流スパッタリング法で各アルカリバリアー膜を形成後、かかるアルカリバリアー膜上に直流スパッタリング法により連続して1T膜を形成し、その後、90℃に24時間保存したが、1T膜の外観変化はなかった。

【0030】

【作用】本発明において、Snはターゲット中でSn-Si合金として存在するが、反応性スパッタ中にターゲット上に生ずる酸化物は錫の酸化物と珪素の酸化物である。このうち前者は導電的性質をもつため、アーキング

*実施例1と同様のガラス板にSiH₄とO₂ガスを用いてCVD法によってSiO₂膜を1000Å形成した。

【0023】実施例1品と比較例1品をそれぞれ純水に接触させて90℃に24時間保持した後、純水中に溶出したNa⁺の量を測ってアルカリバリアー性を調べたところ実施例1品では0.61μg/cm²、比較例1品では0.61μg/cm²であった。また、実施例1品と比較例1品をそれぞれ5%NaOHで洗浄し、次に純水に室温で24時間接触させて純水中に溶出したNa⁺の量(上記洗浄中に吸着したNa⁺の量)を測ってアルカリ吸着性を調べたところ、実施例1品で0.13μg/cm²、比較例1品で0.14μg/cm²であった。このことから、実施例1品は比較例とほぼ同等の特性があることがわかった。

【0024】実施例2

実施例1と同様にして、Sn_{0.5}Si_{0.5}O₂膜を約200Å形成した。

【0025】実施例3

ターゲットとしてSnSi₂ターゲット(Sn:Si=1:2)を用い、他は実施例1と同様にして、Zr_{0.33}Si_{0.67}O₂膜を約200Å形成した。

【0026】実施例4

実施例3と同様にして、Sn_{0.33}Si_{0.67}O₂膜を約500Å形成した。

【0027】実施例2～4品につき、それぞれ純水に接触させて、85℃に24時間保存した後、アルカリバリアー性及びアルカリ吸着性を測定したところ表2のようになった。

【0028】

【表2】

の発生が抑制されることがえられる。

【0031】

【発明の効果】本発明の電導性ガラスのアルカリバリアー膜は、直流スパッタリング法により成膜できるので、大面積にわたり均一な膜を高速で安定的に形成し提供することができる。これは、アルカリバリアー膜上に形成される電導膜を直流スパッタリング法で形成する場合にはインライン式でアルカリバリアー膜と電導膜を連続して成膜できるので特に生産性の上で大きな利点となる。

【0032】本発明のアルカリバリアー膜付電導性ガラ

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スは、液晶素子、エレクトロクロミック素子、電場発光素子などの表示素子やアモルファス太陽電池基板等に用いられる電導性ガラスのアルカリ触媒防止膜として特に最適であり、表1からわかるように耐熱性も有しており、かかる表示素子、太陽電池等の製造過程やその後の種々の環境条件に対しても安定で劣化することがない。勿論これらの他にも、自動車、航空機、鉄道車両その他各種交通車両用、建築用、各種装置用、光学部品用、電

気部品用、電子部品用のガラス板に電導性被膜、熱線反射防止被膜、反射被膜、着色被膜、その他各種機能を持った被膜を形成する際の下地コートに対し有用に適用できるものである。

【0033】また、本発明のアルカリバリアー膜はSnの金属とS1の割合を変えることにより所望の屈折率とすることができるので、上記各種用途に広範囲に利用できる。

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